

OUR ASTRONOMICAL COLUMN.

LARGE METEOR ON JANUARY 4.—This brilliant object was observed at about 10.20 p.m. at the Royal Observatory, Greenwich; by Mrs. F. Wilson, Totteridge; by the Rev. Canon Grensted, Liverpool; and by the Rev. H. C. Bender, Chelsea, S.W. As viewed from the metropolitan district the meteor traversed the region of Pisces, while, as seen from Liverpool, the path lay amongst the stars in the western part of Canis Major.

Mr. Denning writes us that the data already to hand indicate that the object was very low in the atmosphere, its height being approximately from forty-four to eighteen miles above the earth's surface from a point six miles E.N.E. of Salisbury to four miles S.E. of Tetbury. Had the meteor survived during another twenty-five miles of flight it would have fallen to the ground in the locality about ten miles S.E. of Ross, or twelve miles E. of Monmouth, and this may have actually occurred, though the descent was not observed. The fallen mass may, however, yet be discovered. In the case of the meteorite of October 13, 1914, though the light and detonation were noticed over a considerable area, the fall of the object was not witnessed, but it was accidentally discovered, embedded in the soil, on the following day.

EXTRA-FOCAL PHOTOMETRY.—Among the many methods employed in photographic photometry, the extra-focal method developed by Parkhurst has the great advantage that only a simple equipment is required. The plate being exposed in the camera beyond the focus, the resulting images have relative densities varying with the brightnesses of the stars, and, by means of a Hartmann microphotometer, these can be compared with artificial star discs of known relative magnitudes. At the Laws Observatory, University of Missouri, investigations of the method have lately been made by R. H. Baker and Edith E. Cummings, using a 5-in. photographic doublet, attached to a $7\frac{1}{2}$ -in. refractor as guiding telescope (Bulletin No. 24). The greatest known source of error is sky-fog, the effect of which is greatest for the fainter stars. This and other possible sources of error have been fully investigated, and means of overcoming them have been found. Tests of the accuracy attainable were made on eight plates containing double exposures of selected circumpolar regions, on which 196 stars were suitable for measurement. The star images ranged from 0.3 to 0.5 mm. in diameter, and it is shown that the advantage of such small images in reducing overlapping and exposure time does not involve any loss of accuracy. The probable error of a single observation was about one-twentieth of a magnitude, so that the extra-focal method compares favourably with other methods. Twelve eclipsing variables are under investigation.

HYDERABAD OBSERVATORY.—From the annual report of the director of the Nizamiah Observatory, Hyderabad, for the year ending October 5, 1916, we learn that, although serious inconveniences have been caused by the war, substantial progress has been made with the work for the Astrographic Catalogue. Besides the investigation of proper motions by measurement of plates taken at Oxford, Mr. Pocock reports that 134 plates were taken and measured during the year. In zone -17° , 143 plates, containing 56,302 stars, have now been completely reduced and the results partly printed, while in zone -18° copy for press has been prepared for 102 plates, containing 42,545 stars. Much work has also been done in connection with the magnitude scales of the various catalogues used in connection with the astrographic work.

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EDUCATIONAL POSITION AND OUTLOOK.

AFTER-WAR problems dominated the various sectional meetings of the Conference of Educational Associations held last week, and the two schemes of reform suggested by the Education Reform Council and the Workers' Educational Association were frequently in evidence. Three main lines of thought could be noted. One took up the burden of the Master of Balliol's inaugural address in his insistence upon the need for an educated democracy. Thus Principal Maxwell Garnett, of the Manchester School of Technology, speaking on the vocational outlook before the Child Study Association, urged that primitively interest was aroused by things to be done; thus permanent neurographic records were formed, and from these neurograms interest systems were created which tended always to grow. Hence it was wise to develop a single wide interest and a power of concentrated attention, and such interest systems, developing in adolescence, if centred round one's vocation, would produce a body of workers who would be at once more effective and more contented. At the same time, there was need to reserve from all classes those who would become prophets and thinkers. This last was the note of Prof. Shelley's address before the Teachers' Guild; a healthy democracy must evolve an aristocracy whilst at the same time fostering the forces that would destroy it, and always there must be a selection of the most vigorous personalities who would express the ideals and aspirations of the age. This involved, as Principal Garnett also insisted, some other method than the crude intellectual test of selecting those who should proceed by scholarships to higher centres of learning. Prof. Gilbert Murray had pointed out at the previous meeting the corollary to this, that there should be secured to the youth of all classes the best education for which each was intellectually fitted.

A second main line of thought had to do with the classics-science controversy, with science in favour. Thus Sir Alfred Keogh, presiding at the Education Reform Council meeting, urged that the lack of knowledge of elementary facts of science and Nature shown by Ministers and administrators was a national misfortune, and that every boy destined for public life should have a very liberal education both in science and classics. The other side was given at the Association for the Reform of Latin Teaching, where, however, Dr. Rouse deplored the almost complete failure of the reformers to influence the teachers of classics. On the question of the teaching of science in secondary schools, an interesting point was raised by Prof. Nunn, in the discussion on women's work in boys' schools, before the Froebel Society. He thought that whilst the biological sciences were safe in their hands, the physical sciences were not. Such practical developments of mathematics and the physical sciences as engineering were nearer to men's interests, and if women were to treat these in any but an academic manner they must be brought into direct contact with such practical developments.

A third main line of thought was that of the position, prestige, and salaries of teachers. At no previous conference has this point been so frequently emphasised by chairmen and lecturers, and in reference to all grades and classes. Greater culture and efficiency and a wider training were constantly in demand, and to attract the right men and women to the profession a more generous recognition and remuneration were needed—and the teachers were not those who insisted; they only applauded.

The annual meeting of the Geographical Association was held at the London Day Training College on January 5-6, with Sir Thomas Holdich, president, in

the chair. The position of geography as the bridge subject between the humanistic and the purely scientific studies was well brought out in the papers and discussions. Mr. H. J. Mackinder, M.P., in opening a discussion on the resolutions drawn up by the Five Associations, quoted a statement issued by the council of the Geographical Association with regard to the teaching of geography. In this document the object of teaching geography in schools is said to be to train future citizens to imagine accurately the interaction of human activities and their topographical conditions. It is pointed out that as these conditions have been established partly by natural forces and partly by human effort, any discussion of the correlation of the various conditions must be both scientific and humanistic. The case is summed up thus:—"The unity of geography, for school purposes at any rate, is essentially humanistic, and on one side related closely to history, but the assembling of the physical data is a very important part of geographical teaching and cannot be left to the teacher of other subjects."

Two other papers brought out the relationships of geography, and at the same time curiously emphasised the fact that geography is a subject in itself. Prof. Fleure read a paper on "Regions in Human Geography," which was saturated with humanism, and was marked by a strong historical flavour, and yet was in no sense history. "Correlation of various conditions" within a region is essentially geography, whatever it is or is not. "Though essentially humanistic" and "related to history," geography has a unity of its own. Prof. Nunn read a paper to a joint meeting of the association and the Mathematical Association on "Map Projections." The relationship of geography to science was taken for granted in the meeting, just as the joint meeting last year with the Historical Association took the humanistic relation for granted. What was perhaps more striking with regard to the paper was the different point of view of the geographer from that of the mathematician, even a most sympathetic mathematician, in regard to this almost purely mathematical subject. It was quite evident that while both geography and mathematics gain immensely by correlation, yet there is very distinct work for each. The danger of leaving projections for geographical work entirely to the mathematical teacher, or, indeed, for mathematical training to be left to the geographical teacher, was unmistakable. Again, to quote the statement, "the assembling of the physical data . . . cannot be left to the teachers of other subjects." The last sentence of the statement stands true: "Experience has shown that the art of geographical correlation depends on specially trained habits of thought."

The Mathematical Association held its annual meeting on January 5, under the presidency of Prof. Whitehead. After the business meeting—at which Prof. T. P. Nunn was elected president for 1917-18—Prof. Nunn read an important paper on "The School Course in Geometry," illustrated by many interesting models and practical devices. He urged that geometry should be closely connected with the facts of life and that the pupils should approach it through practical work of various kinds; that many topics which have hitherto been postponed to a late stage or omitted altogether—e.g. certain facts of solid geometry and the simpler properties of the conic sections—should be introduced at a comparatively early stage; and that the reasoning, while of a nature suitable to the stage reached, should throughout be careful and rigid. In this connection he distinguished three stages: the first that of simple intuitional reasoning in connection with direct experience; the second that of deductions based upon the assumption of certain fundamental truths; and the third that of constructing a system of geo-

metrical truths on the smallest possible basis of assumptions.

The afternoon session opened with an inspiring address from Prof. Whitehead on "Technical Education." His main thesis was that a liberal education should in all cases be in close touch with the activities of life; and it should include in varying proportions the literary, scientific, and technical elements. These should be closely connected; technical education needs the enlightenment of science, intellectual education lacking some relation to handwork is barren, while the literary element supplies that wider contact with other life and thought which is essential to healthy mental life. Only so can we reach the ideal in which "work is play and play is life," and nothing but harm can come of the assumption that the practical world is one in which high ideals can have no place.

Later in the afternoon Mr. P. Abbott opened a discussion on "The Place of Mathematics in Educational Reconstruction," dealing chiefly with the mathematics suitable for continuation schools. Other speakers dealt with other aspects of the subject.

The twenty-fifth annual general meeting of the Incorporated Association of Headmasters was held at the Guildhall, London, on January 8. The Rev. J. R. Wynne-Edwards (Leeds Grammar School), in his presidential address, said that in science teaching in schools two chief objects are in view—first, the acquisition of facts that "every educated man ought to know," the laws of Nature, the constitution of our planet and its atmosphere, the chief properties of light, heat, and electricity, and their bearing on daily life; and secondly, the investigator's respect for truth, his determination to observe phenomena irrespective of preconceived ideas, and to reason on observed facts without being hampered by preconceived theories. Of these two objects the second is by far the more important. It is agreed that the time has come to improve our system of science teaching and to bring science to bear more fully on the problems of our daily life; but difficulties present themselves the solution of which will tax all the ingenuity of the nation. At present there is not an adequate supply of teachers, and it is absolutely essential that a solution of this difficulty should be found. Another difficulty is to adapt science teaching to the need of industry without taking away its power as an intellectual stimulus, and to persuade the manufacturers of the country that it is to their interest to have the very best advice that science can give them and to pay for it accordingly. One still hears of graduates serving in Government munition works as science experts at 2*l.* a week, which they are prepared to accept in their anxiety "to do their bit" for their country, while workmen in the same works may be earning their 5*l.* or 6*l.* per week. There are, however, signs of a change, and the great demand and very limited supply of expert science men is giving rise to abnormal conditions.

The following resolution was carried by 70 votes to 15:—"That it is of the highest importance to the welfare of this country that the decimal system of weights and measures be adopted, and that this association approves of the policy and aims of the Decimal Association, and invites its members to support the proposals."

PRIZE AWARDS OF THE PARIS ACADEMY OF SCIENCES FOR 1916.

MATHEMATICS.—The Grand Prize of the mathematical sciences. No memoir was received dealing with the question proposed, but a prize of 2000 francs was awarded to N. E. Nörlund, professor at the University of Lund, for his work on the linear equations